

[0035] What is claimed is:

1. A high bandwidth semiconductor photodiode responsive to incident
2 electromagnetic radiation comprising:
 - 3 an absorption narrow bandgap layer;
 - 4 a wide bandgap layer disposed substantially adjacent to the absorption
5 layer;
 - 6 a first doped layer having a first conductivity type disposed substantially
7 adjacent to the wide bandgap layer; and
 - 8 a passivation region disposed substantially adjacent to the wide bandgap
9 layer and the first doped layer.
1. The semiconductor photodiode of claim 1 further comprising a second
2 doped layer disposed substantially adjacent to the absorption narrow
3 bandgap layer.
1. The semiconductor photodiode of claim 2 further comprising a third
2 doped layer disposed substantially adjacent to the first doped layer and
3 adapted to form an ohmic contact with a substantially adjacent
4 metalization layer.
1. The semiconductor photodiode of claim 1 further comprising:
 - 2 a second doped layer; and
 - 3 an impact layer disposed substantially adjacent to the second doped layer
4 and the absorption narrow bandgap layer,

5 wherein the ratio of the ionization coefficient for electrons relative to the
6 ionization coefficient for holes for the impact layer is larger than the
7 corresponding ratio for the absorption narrow bandgap layer, the wide
8 bandgap layer, the first doped layer, and the second doped layer.

1 5. The semiconductor photodiode of claim 1 wherein the first doped layer
2 comprises indium phosphide

1 6. The semiconductor photodiode of claim 1 wherein the absorption layer
2 comprises indium gallium arsenide.

1 7. The semiconductor photodiode of claim 1 wherein the wide bandgap
2 layer varies in thickness from an etching thickness t_1 to a deposition
3 thickness t_2 .

1 8. A method for fabricating a shallow mesa semiconductor photodiode,
2 comprising the steps of:

3 generating an absorption narrow bandgap layer;

4 generating a wide bandgap layer disposed substantially adjacent to the
5 absorption narrow bandgap layer;

6 generating a first doped layer disposed substantially adjacent to the wide
7 bandgap layer, the first doped layer having a first conductivity type;

8 etching a region of the first doped layer;

9 etching a region of the intrinsic wide bandgap layer; and

10 generating a passivation region disposed substantially adjacent to the first
11 doped layer and the intrinsic wide bandgap layer.

1 9. The method of claim 8 further comprising generating a second doped
2 layer disposed substantially adjacent to the absorption narrow bandgap
3 layer.

1 10. The method of claim 9 further comprising generating a third doped layer
2 disposed substantially adjacent to the first doped layer and capable of
3 forming an ohmic contact with a substantially adjacent metalization layer.

1 11. The method of claim 8 further comprising:
2 generating a second doped layer; and
3 generating an impact layer disposed substantially adjacent to the second
4 doped layer and the absorption narrow bandgap layer,
5 wherein the ratio of the ionization coefficient for electrons relative to the
6 ionization coefficient for holes for the impact layer is larger than the
7 corresponding ratio for the absorption narrow bandgap layer, the wide
8 bandgap layer, the first doped layer, and the second doped layer.

1 12. The method of claim 11 further comprising generating a third doped
2 layer disposed substantially adjacent to the first doped layer and capable
3 of forming an ohmic contact with a substantially adjacent metalization
4 layer.

1 13. The method of claim 8 wherein the first doped layer comprises indium
2 phosphide.

1 14. The method of claim 8 wherein the absorption layer comprises indium
2 gallium arsenide.

1 15. The method of claim 8 wherein the wide bandgap layer varies in
2 thickness from an etching thickness t_1 to a deposition thickness t_2 .